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Deficit irrigation and the reuse of reclaimed water as strategies to cope with water scarcity in perennial crops. A summary of long-term trials within the H2020 SHUI project

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In arid and semi-arid regions, restriction on water for agriculture is fostering the search of alternative water resources, such as the reuse of reclaimed water (RW), and water-saving techniques, such as regulated deficit irrigation (RDI) strategies to cope with forecasted food production requirements. Two long-term experiments carried out by the CEBAS-CSIC team offer two scenarios: 1) Intensive cultivation of citrus in coastal areas and 2) extensive grape production for wine making in inland areas of Spain. Experiments in the Murcia Region (Spain) studied the physiological and agronomic effects of irrigating a young commercial grapefruit orchard with two water sources (saline RW versus conventional water). Water transferred from an irrigation canal (TW; electrical conductivity, EC≈1.3 dS m^{-1}) and RW from a wastewater treatment plant (EC≈3.0 dS m^{-1}) were compared, with control irrigation supplying 100% of the crop evapotranspiration (ETc) while the RDI treatment was irrigated at 50% of ETc during the 2nd stage of fruit growth Although the RDI treatment decreased annual irrigation volume by 13.2%, soil salinity substantially increased in summer in the RDI treatment While these treatments did not negatively affect vegetative growth, yield and fruit quality, trial duration (2008-2010) was short in relation to the commercial life of a citrus grove, requiring further research over a longer term. This highlights the need for a longer-term socio-economic analysis that is possible within projects of SHui's duration (2018-2021). In grapevines research initiated in 2012 continues within SHui, to explore the effects of applying two different strategies: a) RDI in comparison with rainfed conditions and a full irrigation control. During the first three seasons (2012-2014), SDI was the preferred strategy to substantially improve yield (by 49%) compared to the rainfed regime, thereby significantly increasing water use efficiency (calculated considering both precipitation and irrigation). However, yield increments at 100% ETc were offset by detrimental effects that full irrigation had on grape composition. In this case, 8 years of these irrigation treatments produced similar results to the first three seasons of water application, suggesting cost benefit analyses of different deficit irrigation treatments over 3 may provide useful results to inform farmer choice